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The effect of digital games on Iranian children's vocabulary retention in foreign language acquisition

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Abstract

In the present study, the effect of using a digital computer game and its role on promoting Iranian children's vocabulary learning was investigated. In the experimental group, the SHAIEx digital game was used whereas in the control group, English vocabulary was taught through traditional methods. At the end of the teaching period, the participants' performances were compared. The results indicated that the mean score of the children in the experimental group was significantly higher than those in the control group, indicating the positive effect of using digital games in teaching English vocabulary to children.

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1. Introduction

Nowadays in the 21st century we are living in a digital world dominated by computers and the internet. Even in the remotest and poorest parts of the world, people can have access to computers. The use of digital media has shaped our lives and the way we live and interact with others and our surroundings. Children are no exception to this rule. In fact today's children of all ages are living in a highly media influenced environment with access to a variety of digital electronic devices which are accessible both at home and elsewhere including school. Children spend most of their leisure time interacting with computers and playing computer games. According to the published statistics, each day the average teenager in America watches over 3 hours of television, is on the internet one-half hour and plays one and a half hours of video games (Prensky, 2001). Three quarters of children play regularly, but it is not clear whether this is harmful or beneficial and whether children learn while they are playing (Kirriemuir & McFarlane, 2004). So it is not surprising to see that today, most language teachers in the world are using digital games for teaching second language particularly to children. The uses of computer-assisted instruction (CAI) and multimedia in education have significantly changed our children's learning and cognitive process. Results from a number of research studies indicate that appropriate designed CAI programs enhance students' learning

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performances in Scientific, mathematics, and literacy. Interestingly, despite having the same multimedia capability as CAI, the potential learning impact of digital games is often discounted by parents and educators due to the results of aged studies about children's behaviours of game playing (Chuang & Chen, 2007a). Several studies have found that computer use enhances children's fine motor skills, alphabet recognition, concept learning, numerical recognition, counting skills and pre-mathematical knowledge, cognitive development, and self-esteem or self-concept (Agudo et al, 2007b).

1.1. Definition of game and theoretical backgrounds

Gaming is a characteristic of human nature, hence it can be claimed that the history of gaming goes back to the beginning of the history of human being (Demirbilek, Yilmaz, & Tamer, 2010). Although there has been no clear definition of game, many theoreticians have mentioned that game is a natural part of children's life and give different definitions related to game. Moreover, due to the different effects of games on individuals' development, researchers have given different definitions of game (Donmus, 2010). Ludwig Wittgenstein (1953) was probably the first academic philosopher to address the definition of the word game. Wittgenstein demonstrated that the elements of games, such as play, rules, and competition, all fail to adequately define what games are. Wittgenstein concluded that people apply the term game to a range of disparate human activities that bear to one another only what one might call family resemblances. Alcorn (2003) states that games are a kind of sport or entertainment that require participation, competing with oneself and other rivals in order to achieve certain goals and have special rules. In order for an application to be a game, it requires to have rules and certain targets to be followed (Donmus, 2010). Piaget defined game as assimilation of stimuli from outside world and put them into adaptation system. Piaget made comments on games only in terms of their effects on children's development. However, in today's changing educational system, it can be said that games may be effective on every age group by shaping them appropriately during developmental period (Donmus, 2010). According to Juul (2003) a game is a rule based formal system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels attached to the outcome, and the consequences of the activity are optional and negotiable. The game definition he proposes contains six parameters: 1) Rules: games are rule-based. 2) Outcome: games have variable, quantifiable outcomes. 3) Value: that the different potential outcomes of the game are assigned different values, some being positive, some being negative. 4) Effort: that the player invests effort in order to influence the outcome. 5) Player's attachment: that the players are attached to the outcomes of the game in the sense that a player will be the winner and happy if a positive outcome happens, and loser and unhappy if a negative outcome happens 6) Negotiable consequences: the same game can be played with or without real-life consequences (Ang & Zaphiris, 2008). Educational games are activities that provide students the opportunity to reinforce the previous knowledge by repeating it in a more comfortable environment. Educational games are software that helps students to learn the lesson subjects and to develop their problem solving skills by using their desire and enthusiasm to play (Donmus, 2010).

According to Verenikina, Harris and Lysaght (2003) theories about play are generally divided into classical and modern. Classical theories date back to the late nineteenth and early twentieth century. They look at the driving forces of children's play and mainly focus on its physical and instinctive aspects. According to the earliest classical theory, humans play when they have excess energy. Hence this theory is termed surplus energy theory. Surplus energy theory contends that humans have a finite amount of energy that is used mainly for work and survival. Children tend to play more than adults, as children are not so involved in work and survival activity, and therefore have greater amounts of energy to expend. By discharging excess energy in play, balance is restored to the human body. Recreation or Relaxation play theory argued that play is used to restore energy. A significant departure from these two energy-related theories of play came in the form of Recapitulation theory, espoused by Hall in 1906. Hall asserted that in play, we relive our evolutionary past. For example, children enact the animal stage of evolution by climbing and swinging. Rather than looking back, an alternative classical explanation of play looks forward, in maintaining that play prepares children for adulthood. Based on the assumption that play is unique to childhood, Groos argued that play develops children's physical and mental capacities that will serve them as adults. The significance of this theory rests in part with Groos' focus on play types other than physical play. For example, Groos considered children's enactment of adult roles and activities in what we now call pretend play, make-believe play or imaginative play. In part, too, the importance of this theory lies in its consideration of intellectual or cognitive benefits of play for children (Verenikina, Harris & Lysaght, 2003).

Modern theories of play are concerned with the ways that play benefits children's psychological development. They have continued to impact on early childhood programs, particularly in under-fives settings, where we now see play located at the heart of the curriculum and used as a vehicle for nurturing children's development across its various domains. Thus they are conceptually different from the classical theories. One of these modern theories about play was proposed by Piaget in 1962. He changed the focus of study from social and emotional aspects of play to children's cognition. He placed play within his stage-based theory of cognitive development and assigned it a significant role in the growing of children's minds. Underpinning his views of how play contributes to children's cognitive development are two processes whereby children construct knowledge, assimilation and accommodation. Piaget maintained that it is assimilation that is dominant in play—children take something and make it fit to what they know, such as when a child makes rolled paper to be a royal sceptre. Talking about symbolic play, he outlined the importance of play in the development of children's mental representation and abstract thinking (Verenikina, Harris & Lysaght, 2003). Fundamental theoretical framework of game play (flow theory) was drawn by Csikszentmihalyi in 1990 and the effect of games on the cognitive development of children was defined in the literature by Piaget in 1929. Korhonen, Montola and Arrasvuori state that digital games provide social interactions. In his flow theory, Csikszentmihalyi states that individuals, who play games, lose themselves during game activities and fascinating subjects of oncoming events (Demirbilek, Yilmaz, & Tamer, 2010).

1.2. Literature review

Research has been conducted to investigate the role of digital computer games and their value in learning second language. The research of computer game based language learning focuses on computer games as a virtual environment that supports language learning on its own and computer games as a tool or medium to facilitate collaborative learning (Ang & Zaphiris, 2008). This is not an exhaustive literature review on these two aspects of digital computer games research but we intend to represent a few examples from the literature concerned with the use of digital computer games in learning second language.

deHaan (2011) has investigated teaching and learning English through digital game projects. Two completed extracurricular projects, based on constructionist learning and media literacy theories and practices, are described in his paper: game design and game magazine creation. The action research projects aimed to guide students towards a better understanding of games' formal features and technologies through their active creation of games and game-related media, and to improve their spoken and written English language skills. In general, students learned and practised a variety of language and technology skills with the design projects. The projects motivated the students, challenged the students, and provided many opportunities for authentic discussions in the foreign language.

deHaan, Reed and Kuwada (2010) have investigated the effect of interactivity with a music video game on second language vocabulary recall. Their experimental study investigated to what degree video game interactivity would help or hinder the noticing and recall of second language vocabulary. Eighty randomly-selected Japanese university undergraduates were paired based on similar English language and game proficiencies. One subject played an English-language music video game for 20 minutes while the paired subject watched the game simultaneously on another monitor. Following game play, a vocabulary recall test, a cognitive load measure, an experience questionnaire, and a two week delayed vocabulary recall test were administered. Results were analyzed using paired samples t tests and various analyses of variance. Both the players and the watchers of the video game recalled vocabulary from the game, but the players recalled significantly less vocabulary than the watchers. This seems to be a result of the extraneous cognitive load induced by the interactivity of the game; the players perceived the game and its language to be significantly more difficult than the watchers did. Players also reported difficulty simultaneously attending to game play and vocabulary. Both players and watchers forgot significant amounts of vocabulary over the course of the study.

Wang (2010) has studied the effect of using communicative language games in teaching and learning English in Taiwanese primary schools. The aim of his study was to examine the use of communicative language games for teaching and learning English in Taiwanese elementary schools. The participants were 150 teachers teaching in Taiwanese primary schools. The instrument used was a survey questionnaire about participants' perspectives on the use of communicative language games in English lessons. The results of the study provided encouraging evidence to indicate that Taiwanese elementary school teachers generally appreciated the benefits and value of communicative game activities in the teaching of English language. The findings also suggested that when facing students with

different backgrounds, learning styles, needs, and expectations, teachers should be aware to take learners' individual variations into account and be more flexible in their use of communicative games in order to maximize educational effect. It is hoped that communicative language games will attract more attention and will be applied more widely in the classroom with more positive attitudes on the part of language teachers.

Turgut and Irgin (2009) have studied young learners' language learning via computer games in Turkey. This qualitative research based on phenomenological theoretical framework investigates young learners' experiences of language learning while playing computer games in internet cafes. The data was collected through observations and semi-structured interviews and analyzed through phenomenological data analysis steps. The results indicated that young learners' playing online games promotes language learning and especially vocabulary skills.

Chuang and Chen (2007b) have studied the effect of digital games on children's cognitive achievement. Theirs study investigated whether digital games facilitate children's cognitive achievement in comparison to traditional computer-assisted instruction. One hundred and fifteen third-graders from a middle/high socio-economic standard school district in Tainan City, Taiwan participated in the study. Results indicate that digital game playing not only improves participants' fact/recall processes, but also promotes problem-solving skills by recognizing multiple solutions for problems.

Segers and Verhoeven (2003) have studied about training by computer in kindergarten. Intensive vocabulary training by computer was undertaken in a two-year kindergarten programme in the Netherlands. In the intervention, 67 native and immigrant children in the first and second years of kindergarten played vocabulary games on the computer twice a week for a period of 15 minutes over 15 weeks. A control group of 97 kindergartners followed the regular curriculum. In a pre-test-training-post-test-retention test design, positive effects of the computer training were found on a curriculum-dependent vocabulary test. A trend was found towards positive effects of the computer training on a curriculum-independent test for children in their second year of kindergarten.

1.3. Purpose of the study

In the sophisticated world of the 21st century, children spend most of their time playing digital computer games and educators all over the world are increasingly employing these games for educational purposes including second language acquisition. Learning vocabulary and the process of vocabulary retention have a vital role in second language acquisition. There is a relationship between language learning in early ages and digital games because children are able to understand language with digital games easily. Using games in young learner's class smoothes their learning because the games capture their attention and motivate them. Instead of making students do a lot of homework in a threatening environment after class and repeating after the teacher all the time aimlessly, a good and energetic teacher can encourage the creativity and imagination of the learners by using digital games because they are fun and children like to play them. Through playing digital games, even the shy students participate in language learning. Therefore the purpose of this study was to determine the effect of using a digital computer game called SHAIEx, which will be explained in detail in the next section, on a group of Iranian chlidren's vocabulary retention in acquisition of English as a second language at primary level. Our main hypothesis which was put to test was that using SHAIEx digital game would have a positive effect on vocabulary retention of the children. This was a novel study as similar studies had not been undertaken previously in Iran.

2. Methods

2.1. SHAIEx digital computer game

SHAIEX (*Sistema Hipermedia Adaptativo para la ensenanza de idiomas en entorno Linex*) stands for Adaptive Hypermedia System for the Teaching of Languages at Early Ages built in Linux. It is a long-term government funded project being developed since 2004 at the University of Extremadura by the interdisciplinary research team GexCALL (Research Group for Computer Assisted Language Learning). The hypermedia is developed as a result of linking two technologies: multimedia and hypertext. A computerized multimedia application involves different audiovisual means to represent the information (e.g. text, images, sound and video). The hypertext, on the other hand, consists of a series of text blocks connected or linked among themselves in a way that users can pass from one

block to another in the order they wish and according to the user's needs, interests and/or point of view. Consequently, the hypermedia allows us to structure the information in a non sequential way and that information can integrate different means (i.e. text, graphics, sound and video). The hypermedia benefits in the learning process are unquestionable. On the one hand, it enables the student to freely explore the knowledge depending on their necessities and goals. On the other hand, the information is transmitted by using different sensory channels, important in the didactic process. However, in these systems the student can freely explore the knowledge (information) appropriate or not to the student's cognitive level. Different aspects of this game have been investigated in detail in various publications (Agudo, Sanchez & Rico, 2010; Agudo et al, 2007a; Agudo et al, 2007b; Agudo et al, 2007c; Agudo et al, 2006a; Agudo, Sanchez & Rico, 2006b; Agudo, Sanchez & Sosa, 2005; Cumbreno et al, 2006; Edwards et al, 2008; Rico, Agudo & Curado, 2007a; Rico, Curado & Edwards, 2007b). Games in SHAIEx include choose, body identification, stickers, counting, matching and colouring among others. These games are configurable and adaptable to the difficulty, interaction style and educational level corresponding to a particular child. In the "Choose" activity, several objects (characters, things, animals etc.) appear and the child listens to the name of one object. Then she/he must select the corresponding object representing the sound heard. In the "body identification" activity a character appears on the left of the scene with several parts of its body blocked out in grey, and on the right, the parts of the body that the child must position in the holes are shown. A sound determines which part of the body goes first. In the "stickers activity" the child must place the objects in the corresponding silhouettes. In the "counting" activity the student must count the objects that appear on the screen. A sound determines the type of object to be counted. In the "matching" activity the children must find all the matching pairs of objects (characters, things, animals etc.). In the "colouring" activity an uncoloured picture and a palette of colours appear. The child must click on a part of the body and listen for the name of a colour. He/she then chooses the colour on the palette and proceeds to colour the part of the body on the easel. When the child gets an option right or wrong in the games, he/she respectively receives a positive splash of confetti, or on the contrary, a negative squashed tomato as feedback from the games to motivate and capture his/her attention in a fun way. The SHAIEx digital game was kindly provided by J. Enrique Agudo of the Extremadura University, Spain through personal communications.

2.2. Participants

The participants were 40 six to seven year old girls with no prior knowledge of English which were divided into two equal groups of experiment and control each consisting of 20 participants.

2.3. Instruments

Computer equipped with the appropriate digital games software installed, black board, marker, flash cards and posters for learning different numbers, animals, colors and family members were used in this study.

2.4. Data collection procedure

During a 45 day teaching period, which consisted of three 90 minute sessions during the week, children in the experimental group were taught English vocabulary consisting of the names of different animals, family members, colors and numbers using digital game while children in the control group didn't use digital game and were taught lessons using the traditional methods. The digital game software used was called SHAIEx. The pedagogical domain consisted of seven didactic units and comprised points of interest for pre-schoolers: hello, the body, home, the family, toys, food, and school. Each didactic unit includes four blocks of activities: presentation, interaction, evaluation and review. The child selected a didactic unit by clicking on the associated icon. SHAIEx automatically searches for activity scenes of the selected unit according to his/her educational level and whose pre-requisites have been satisfied by the newly acquired knowledge. A transition scene is dynamically generated and presented to the child. This type of scene contains graphical, audible and clickable icons showing links to the next activities that the child could carry out. At the end of the experimental period, final vocabulary test was undertaken by both groups of children. The results of the final test in both groups were expressed as mean ± standard deviation and were statistically compared using the independent sample t-test with the SPSS statistical software version 16. Significance was set as $p<0.05$.

3. Findings and discussion

The mean results of the final test in the experimental and control groups are presented in Table 1. The results are based on 10 questions asked from every child about vocabulary as stated in the data collection procedure section at the end of the 45 day teaching period. The marks were given from 10 with 0 being the lowest and 10 being the highest mark.

Table 1. Mean scores on vocabulary retention test

		Vocabulary test scores	
Treatment group	N	Mean	SD
Experiment	20	7.8	1.54
Control	20	6.6	2.03

As it can be seen from the table, the mean score in the experimental group was higher than the mean score of the control group. The results of the independent t-test analysis (Table 2) indicated that the two means are significantly different from each other t (38) =2.10, p=0.042.

Table 2. Results of the t-test analysis

Leven's test for equality of variances		t-test for equality of means		
F	Sig.	t	df	Sig. (2-tailed)
2.268	0.140	2.101	38	0.042

Based on the results it can be concluded, the use of digital game in learning English vocabulary was much more successful in children.

Computer games are today an important part of most children's leisure lives and increasingly an important part of our culture as a whole. We often, as adults, watch in amazement as children dedicate hours to acting as football coaches, designers of empires, controllers of robots, wizards and emperors. In the past, computer games have been dismissed as a distraction from more 'worthy' activities, such as homework or playing outside. Today, however,

researchers, teachers and designers of learning resources are beginning to ask how this powerful new medium might be used to support children's learning. Rather than shutting the door of the school against the computer game, there is now increasing interest in asking whether computer games might be offering a powerful new resource to support learning in the information age. Research into the use of mainstream games in education is relatively novel, but growing rapidly. Research is mainly concerned with the development of related competences and literacies during game play, or the role of games in the formation of learning communities either while gaming or related to game play (Kirriemuir & McFarlane, 2004).Vocabulary has always been one of the most important issues related both with teachers and learners of foreign languages to such an extent that it is believed that without vocabulary nothing can be conveyed (Uzun, 2009). This is particularly evident in countries like Iran where English is taught as a second language and is not the mother tongue language of the children. As a result, children always welcome learning through playing and having fun instead of the more serious classroom scenarios. Processes of language learning have become more engaging by means of educational games which are believed to add fun to classrooms where students would feel more relaxed and comfortable. Games create an environment where education is mostly learner-centred, with a good opportunity for socialisation when well organised, and awakening the will to win and competitive desire inside people (Uzun, 2009). The result of the present study indicates that children in the experimental group were more motivated than children in the control group. They were learning English vocabulary by playing digital game and watching animation on a computer screen and they were not aware that they were engaged seriously in learning a second language. However, children in the control group were fully aware of their serious activity which was learning vocabulary.

Although there is not much statistical research about the use and efficiency of games in foreign language education, there are hardly any negative opinions given against games by teachers or students either. This non-written, statistically or scientifically non-proven fact is a clear indicator that everyone likes games regardless of their age, gender, or level (Uzun, 2009). Yip and Kwan (2006) have shown that students prefer learning that is supported by digital educational games rather than traditional activity based lessons. According to their study, students who were provided with an electronic environment and games became more successful in learning new words compared to those who learned the same vocabulary through activity based lessons. The findings of this study also confirm that children who were taught using the SHAIEx digital computer game learned the new words of English, words previously unknown or unheard by them, much more successfully. Verdugo and Belmonte (2007) have also shown that using digital stories had a positive effect on the understanding of spoken English by a group of 6 year old Spanish children. They employed a pre-post test design to investigate whether internet-based technology could improve listening comprehension in English as a Foreign Language and found that the experimental group outperformed the control group in the final test administered.

4. Conclusion

It can be concluded from the results of this study that digital games have positive effects on the learning process. Using such games in the classroom results in better motivation and facilitates the learning process of children and their cognitive achievement. The learning process becomes much more enjoyable and by engaging children in such games, the stresses involved in the learning process are drastically reduced.

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